

REMARKS

Reconsideration of the above-identified application is respectfully requested.

Claims 1-54 are pending in the present application.

In the Office Action of November 19, 2004, the Examiner rejected Claims 1-18 under 35 U.S.C. §101, as allegedly directed to non-statutory subject matter. The Examiner particularly alleges that the recited elements of Claim 1 are mere software components (e.g., a computer program per se)- thus constituting descriptive non-functional material and hence, not statutory, as there are no "acts" being performed.

In the Office Action, Claims 1-2 and 19-20 are rejected under 35 U.S.C. §102(e), as allegedly being anticipated by Krishnaswamy et al. (U.S. Patent No. 6,622,300)(hereinafter "Krishnaswamy"). The Examiner additionally rejected Claims 3-8, 11, 18, 21-27, 30, 36-45, 48 and 54 under 35 U.S.C. §103(a), as allegedly being unpatentable over Krishnaswamy in view of Holzle et al. (U.S. Patent No. 5,995,754) (hereinafter "Holzle1"). The Examiner additionally rejected Claims 9, 28 and 46 under 35 U.S.C. §103(a), as allegedly being unpatentable over Krishnaswamy in view of Holzle1 and further in view of O'Donnell (U.S. Patent No. 6,374,369) (hereinafter "O'Donnell"). The Examiner additionally rejected Claims 10, 29 and 47 under 35 U.S.C. §103(a), as allegedly being unpatentable over Krishnaswamy in view of Holzle1 and further in view of Benitez (U.S. Patent No. 6,189,141) (hereinafter "Benitez"). The Examiner additionally rejected Claims 12, 31 and 49 under 35 U.S.C. §103(a), as allegedly being unpatentable over Krishnaswamy in view of Holzle1 and further in view of Ronstrom (U.S. Patent Publication No.2002/0010913) (hereinafter "Ronstrom"). The Examiner additionally rejected Claim 13 under 35 U.S.C. §103(a), as allegedly being unpatentable over Krishnaswamy in view of the reference to Alpern et al. entitled "The Jalapeno Virtual Machine", IBM Systems Journal, Vol. 39, No. 1, February 2000 (hereinafter "Alpern"). Finally, the Examiner rejected

Claims 14-15, 32-33, and 50-51 under 35 U.S.C. §103(a), as allegedly being unpatentable over Krishnaswamy in view of the reference to Urs Hölzle, et al entitled "Reconciling Responsiveness with Performance in Pure Object-Oriented Languages", by, ACM Transactions on Programming Languages and Systems, Vol. 18, No. 4, July 1996, pp. 355-400 (hereinafter "Holzle2").

The Examiner did object to Claims 16-17, 34-35 and 52-53 however, indicated that these claims would be allowable if rewritten in independent form to incorporate subject matter of any base and intermediate claims. The Examiner is respectfully thanked for the indication of allowable subject matter.

With respect to the rejection of Claims 1-18 based on 35 U.S.C. §101, as allegedly directed to non-statutory subject matter, applicants disagree in view of the amendments provided to Claim 1. Particularly, independent system Claim 1 has been amended to positively recite additional functional means of the runtime measurements sub-system that cooperatively interact with the controller device and, as amended, the recompilation subsystem means elements, to provide the claimed functionality of configuring a computer to adaptively optimize a computer program executing in a virtual machine execution environment, the virtual machine execution environment comprising one or more compiler devices for providing various levels of program optimization, wherein the system comprises:

a runtime measurements sub-system for monitoring execution of said computer program to be optimized, said monitoring including obtaining raw profile data samples and characterizing said raw profile data, the run-time measurements sub-system comprising:

means for identifying instances of yield points previously inserted at distinguished locations in the program, each yield point indicating a potential sampling operation during execution of the program;

means for determining a condition for performing a sampling operation of the executing program at an identified yield point instance; and,

means for performing the sampling operation of the executing program upon satisfaction of the condition, the sampling including collecting raw profile data used in characterizing behavior of the execution environment, whereby sampling operations performed at yield points occur at a subset of the executions of yield points;

a controller device for receiving said characterized raw profile data from the runtime measurements sub-system and analyzing said data for determining whether a predetermined level of program optimization for said executing program is to be performed by a compiler device, said controller generating a compilation plan in accordance with a determined level of optimization; and,

a recompilation sub-system means for receiving a compilation plan from said controller and invoking a compiler device for recompiling said computer program to thereby attain said predetermined level of program optimization of said executing program in accordance with said compilation plan.

Thus, it is respectfully submitted that the Examiner's rejection of independent Claim 1 based on 35 U.S.C. §101 is obviated as the recited elements of Claim 1 are more than mere software components (e.g., a computer program per se). For instance, in the amendments to Claim 1 provided herein, the runtime measurements sub-system element for monitoring execution of said computer program as recited in Claim 1 now positively recites additional cooperative functional means, e.g., "means for identifying instances of yield points ..."; means for determining a condition for performing a sampling operation ..."; and, means for performing said sampling operation ...including collecting said raw profile data used in characterizing

behavior ...". The controller device element recited in Claim 1 includes cooperating functional recitations: "receiving said characterized raw profile data from ..."; "analyzing said data..."; and "determining whether a predetermined level of program optimization ..."; and "generating a compilation plan ..." and thus, consists of descriptive functional material. Furthermore, Claim 1 has been amended to characterize the recompilation sub-system means as implementing functionality including: "receiving a compilation plan ..."; and, "invoking a compiler device for recompiling said computer program ...". All of the amendments provided to Claim 1 render the Claim statutory as there are positive "acts" being performed in a system comprising a virtual machine execution environment.

Respectfully, the clarification of the term "sampling" performed in the present invention as provided in amendments to Claim 1 and likewise, Claims 19 and 37 do not introduce new matter. For example, full support for the limitations regarding use of yield points inserted into the program for indicating potential sampling operations to be performed that has been added to the runtime measurements sub-system element is provided in the specification (Figure 2, page 8, lines 5 et seq. and page 9, paragraph beginning on line 10) and fully supported by subject matter of commonly-owned, co-pending United States patent Application No. 09/703,527 incorporated by reference.

Given that the amendments to system elements of Claim 1 recite additional functional and structural limitations that cooperatively interact, the claims passes muster under 35 U.S.C. §101 and the Examiner is respectfully requested to withdraw the rejection of Claims 1-18 based on 35 U.S.C. §101.

With respect to the substantive rejections of independent Claims 1 and 19 under 35 U.S.C. §102(e), the Applicants' respectfully submit that the added limitations to Claim 1 (and

new claim steps a)-c) in amended independent Claims 19 and 37) clarify the inventive features previously argued in applicants' arguments submitted in their prior response of October 4, 2004. More particularly, the amendment to Claims 19 and 37 recite features of the sampling operation that Krishnaswamy neither teaches nor suggests, to wit:

a) during program execution, identifying instances of yield points previously inserted at distinguished locations in the computer program, each yield point indicating a potential sampling operation during execution of the computer program;

b) in response to an identified yield point instance, ascertaining a state of the execution environment for indicating whether a sampling operation is to be performed; and

c) when a state of said execution environment indicates a sampling operation performing a sampling operation of said executing program including collecting the raw profile data used in characterizing behavior of the execution environment...

It is respectfully submitted that these new steps comprise and are intended to clarify the previously recited sampling operation with the specific feature that upon encountering an inserted yield point in the executing program, does not necessarily require that a sampling operation be performed. Rather, only upon satisfaction of a condition, i.e., a particular state of the execution environment, will a encountering a yield point instance yield a program sample to obtain profile data; the result being that sampling operations performed at yield points occur at a subset of the executions of yield points.

With respect to the rejection of independent Claims 1 and 19 as being anticipated by Krishnaswamy, applicants respectfully disagree as Krishnaswamy does not teach a sampling technique as implemented in the present invention but rather, at col. 6, lines 21-34, suggests a

low-level "sampling" mechanism such as collecting data from the processor's Performance Monitoring Units) PMU's.

Respectfully, as mentioned hereinabove, no new matter is being entered by these added limitations directed to the sampling operation. Thus, as now recited, amended Claims 1, 19 and 37 functionally distinguish over the cited prior art Krishnaswamy and the Examiner is respectfully requested to withdraw the rejection of amended Claims 1, 9, 19 and 37 based on 35 U.S.C. §102(e).

While the Examiner further alleges that Krishnaswamy has taught the "controller device" element of Claim 1, applicant respectfully disagrees. By way of amendment to Claims 1, 19 and 37, applicant has clarified that the controller device receives the characterized raw profile data from said runtime measurements sub-system and analyzes the data for determining a predetermined level of program optimization for said executing program to be performed by a compiler device, and generating a compilation plan in accordance with said predetermined level of optimization; and, that the recompilation sub-system comprises means for receiving the compilation plan from the controller device and invoking a compiler device for recompiling said computer program to thereby attain the predetermined level of program optimization of the executing program in accordance with said compilation plan. Thus, contrary to the Examiner's indication on page 4 of the Office Action, and particularly, the Examiner's response indicated in paragraph b), the level of optimization set forth in the claims is a predetermined optimization level that is not directly dependent on profile data. That is, the invention look at the characterized raw profile data to chose one of several predetermined optimization levels, however, does not use this data during the recompilation at the chosen level (See page 21, line 27 - page 22 line 15, of the present patent application). Thus, this second element of Claim 1


describes choosing which one of several predetermined levels of optimization to perform based on characterized raw profile data which is clearly set forth in the claim. The present specification teaches (at page 21, line 27 – page 22 line 15, for example) how a compiler may group optimizations into various optimization levels that are predetermined when the compiler is written. Respectfully, no new matter is being entered by incorporation of this amendment to Claim 1 as full support is provided in the cited passage in the specification.

As Krishnaswamy does not teach or suggest implementation of a predetermined level of optimization based on characterized raw profile data, it is respectfully submitted that Krishnaswamy does not anticipate the amended Claims 1, 19 and 37.

Furthermore, in light of the amendments provided to independent Claims 1, 19 and 37 and the arguments in support of patentability thereof, the Examiner is respectfully requested to withdraw the rejections of remaining dependent Claims 3-18, 21-36 and 38-54 under the various obviousness rejections as indicated by the Examiner.

This application is now believed to be in condition for allowance, and a Notice of Allowance is respectfully requested. If the Examiner believes a telephone conference might expedite prosecution of this case, it is respectfully requested that the Examiner call applicant's attorney at (516) 742-4343.

Respectfully submitted,


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